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Journal of the Society of Arts.

FRIDAY, OCTOBER 21, 1859.

COUNCIL.

The following Institutions have been taken into Union since the last announcement :—

Bath Athenæum.
Newington Working Men's Association.
Upper Norwood and Crystal Palace Working Men's Association.
West Bromwich Young Men's Christian Institute.

LEEDS YOUNG MEN'S CHRISTIAN INSTITUTE.

The Prizes and Certificates awarded by the Council of the Society of Arts to the Candidates belonging to this Institution, who were successful at the last Examination, were distributed at the annual soirée which was held in the Victoria Hall, on Monday evening last, the 17th instant, under the presidency of the Earl of SHAFTESBURY. About 1,200 persons were present. A deputation from the Society of Arts, consisting of Sir Thomas Phillips, F.G.S., Chairman of the Council, and Mr. Harry Chester, Vice-President, attended at the invitation of the Committee of the Institute. There were also present the Right Hon. W. Cowper, M.P., Sir Peter Fairbairn, the Hon. A. Kinnaird, M.P., Mr. Edward Baines, M.P., Rev. Canon Stowell, Mr. J. G. Marshall, Mr. John Gott, Mr. W. Shipton, of the Young Men's Christian Institute, London, Mr. John Rand, of Bradford, Rev. J. Blomefield, Rev. J. H. F. Kendall, President of the Holbeck Church Institute, Rev. Dr. Brewer, Mr. Hole and Mr. Pickering, of the Leeds Mechanics' Institute, Mr. Barnett Blake, Agent of the Yorkshire Union, Mr. C. S. Spence, &c. The Committees of the various Institutions in the neighbourhood, in union with the Society of Arts, were invited to attend.

Mr. SPENCE, one of the hon. secretaries, read the report. After congratulating the meeting on the distinguished presidency under which they were assembled, the report stated that there were at present eight honorary members connected with the Institution, 247 regular members, and 182 subscribers; total, 437 members and subscribers. The committee regretted that the Institution had not yet reached a self-supporting basis, and they urged the desirability of individual action in endeavouring to increase the number of members. The library was not large, but the books it contained were of a solid and useful character. The total number of volumes was 956; the issues during the year have been 5,658. At the last Examination of the Society of Arts, the Institute attained the proud position of first in England with respect to class instruction, and as a mark thereof the Local Board received £10 from the Society. Out of 36 competitors from the Institute, 31 were successful. Several of the pupils in addition had competed at Durham, and that evening there would be distributed the certificates and the degree of literate of Durham which had been obtained at the examination in that city within the last few days. The report concluded by an appeal for increased support on behalf of the Institute.

The Right Hon. W. COWPER, M.P., moved the adoption of the report, and in doing so, said he had lately attended the Social Science Congress at Bradford, where they had been taking as comprehensive a survey as they could of the wants of the present day with regard to the social-condition of the population. During the discussions they found, with respect to education, that there was nothing more wanted than some further assistance to the education of persons of the middle classes. Great efforts had been made by the Government in improving the education of the lower classes, and improvement had been made with regard to the higher education of the Universities; and they had also found that great improvement was taking place in the education of the middle classes, but still further efforts were required in that direction more than in any other, and therefore he felt that a meeting like that one was a practical exemplification of what at Bradford they had found to be so necessary. They learnt from the report that the Institution had been directing its attention specially to evening classes, and he was glad to hear that such a marked and signal success had attended the studies of the young men belonging to the Institution. Now, he was of opinion that those evening classes, followed as they were by Examinations and the distribution of prizes and certificates, offered just what was most required, in order to improve the education of those connected with them. By teaching in classes and by lectures, Mechanics' Institutions were a real and valuable assistance to the cause of education generally. Now the great value of such Institutions was that they provided for the leisure of young men, and he believed that there was no sphere in which that struggle between good and evil which was going on in the breast of everyone, was more decided than by the character of the amusements in which they indulged. The best sort of recreation would be found by young men in literature, in the acquisition of knowledge, in improving their faculties, and particularly in directing their studies to those special subjects which were most likely to have a bearing on their future callings. The real recreation worthy of an intelligent and noble-minded people was the recreation derived from books, and he hoped that the library of the Institution would receive such additions as would enable it to afford still further means of study and recreation to its members. He was certainly glad to find that young men had the opportunity and the good sense to associate themselves together and combine on the ground of agreement in religious opinion. He wished to see their religious opinions and feelings influencing more the daily life of the workshop, the market, and all the occupations of life, and he therefore looked with satisfaction on an educational association founded upon union in religious opinions. After dwelling upon the temptations to which young men were subject, and to the value of these institutions as a means of preventing their falling into improper habits, the hon. gentleman expressed his hope that the institution would receive that success which it deserved. There was nothing sectarian, nothing narrow or bigoted in that Association, but its foundation was the broad basis of the truths which were found in the Bible, and which were acknowledged by so large a body of Christians in this country—principles which were strong enough to carry them safely through the world, principles which would give them all one common bond of sympathy and union. He concluded by moving the following resolution :—

> "That the report now read be adopted, and that this meeting expresses its satisfaction at the growing interest felt in the religious and educational agency of the institution, and for the blessings which have been so largely vouchsafed on its efforts during the past year."

The Rev. J. BLOMEFIELD seconded the resolution, which was also supported by the Hon. A. KINNAIRD.

The motion was then put, and carried unanimously.

The Rev. Canon STOWELL moved the next resolution :—

> "That this meeting views with the warmest approbation the object for which the Leeds Young Men's Christian Institute was established, and earnestly commends the numerous advantages offered by it to those who are interested in the spiritual and intellectual welfare of Christian young men."

This Institute differed from Mechanics' Institutions, Lyceums, and Working Men's Colleges (all no doubt good in their way) in this, that whilst the latter were confined to secular knowledge, this made secular knowledge merely the stepping stone to spiritual knowledge. It was sometimes charged against the clerical order that they were jealous of secular knowledge and advancement, but this was not so. They were were not jealous of secular knowledge when sanctified by Christian principle, but they were jealous of mere progress in intellect, in art, in science, and metaphysics, and just on this account, that they believed that rapid progress—high pressure—was dangerous unless under the control and influence of Christianity. He wished not to be misunderstood—he rejoiced in all those wonderful discoveries of science, and those marvellous applications of steam and inventive power of which their age was so fertile, but he did bid them beware of being carried away by the mere love of secular knowledge.

Mr. E. Baines seconded the resolution. He said that surrounded as he was by gentlemen representing the Society of Arts (to which they were deeply indebted for its scheme of examinations), the Parent Society of the Young Men's Christian Institutes in London, and by their Noble President, he would not detain them by more than a few words. He expressed his concurrence in the principles embodied in the remarks of the preceding speaker, observing, however, that if the application of those principles were in any way to be understood as implying a condemnation of institutions which did not include all the objects of Young Men's Christian Institutes—as Philosophical Societies, Mechanics' Institutions, or Schools of Art—then he should be under the necessity of differing from him, but his rev. friend had so guarded what he had said, and so distinctly expressed his high sense of the value of true philosophy, art, and letters, that he did not feel it necessary to say more than that he had for many years supported such Institutions, believing that they were the safeguards of the virtues of the young men belonging to them—and were antagonistic to all that was opposed to virtue and religion, and that though they did not directly promote the teaching of religion, they did indirectly accomplish that object. He need hardly say that in the combination of sacred and secular knowledge, young men would find their greatest happiness and safety.

Mr. Shipton, of London, gave his cordial support to the resolution.

Mr. Spence read a letter from Mr. Beecroft, M.P., apologising for his absence, and expressing his warmest congratulations on the distinguished success achieved by the candidates from the Institution at the examination of the Society of Arts. Letters of apology were also read from the Rev. J. D. Brocklehurst and Mr. C. Wentworth Dilke, Vice-President of the Society of Arts.

The Earl of Shaftesbury, after distributing the prizes, rose to address the meeting. He thought the Christian Association was now so well-established in the public mind, and so widely diffused, that it could require from him no explanation of its purpose, no statement of the service it had rendered, and no appeal to their sympathies for its enlarged support. His lordship adverted to the vast number of young men attracted to London and other large centres of population to assist in carrying on the commerce of the country, and to the difficulties and temptations to which they would be subject when absent from parental influence and domestic control if there were not Christian institutions to which they could resort, where they might repair the mischiefs of the day, and also find consolation and instruction. Referring to the distribution of prizes, his lordship observed that the introduction of prizes was a modification of the original principles upon which the Institute was founded. He was by no means prepared to condemn this, or to say that it could not be turned to a very good and efficient account, but still it was a matter for consideration, because novelties of this description were sometimes received with open hands, and people embraced them as likely to be productive of good; but unless they were duly and carefully watched, they might work a considerable change in the constitution of such a society before they were aware of it. The Committee of the Leeds Institution, however, must be by far the best judges of what were the peculiar necessities of the town, and the character of the persons to whom these prizes were given. It was not for them to close the library or stop the career of the sciences, but it was their duty to place young men in the right channel, to point out to them that, in human existence, though to all it might be given to rise, all could not rise, and many must be content with the simple attainment of knowledge. In conclusion, he reminded them that the Christian life was a life of action, and that the whole duty of man was to fear God and keep His commandments.

Sir Thos. Phillips moved the next resolution:—

> "That this meeting hails with delight the success attendant upon the evening classes of the Institution, and acknowledges with the greatest pleasure and satisfaction the healthy stimulus given to the cause of education by the Society of Arts scheme of education."

He expressed his conviction that there was no danger that secular education would lead to infidelity in opinion or ungodliness in practice, and then explained at some length the special object of the Society of Arts scheme of examination. He concluded by referring to the formation of an Astronomical Society in connection with the Young Men's Christian Institute; and after remarking that they had purchased an excellent telescope, he appealed to the inhabitants of Leeds to support and relieve them from any pecuniary embarrassment which might attend their purchase.

Mr. Harry Chester seconded the motion.

The Rev. W. Guest moved a vote of thanks to the deputation from the Society of Arts, who had come down specially to attend that meeting.

The motion having been seconded, was carried unanimously.

The Mayor then took the chair, and

Mr. Baines moved a vote of thanks to the Earl of Shaftesbury for his kindness in presiding on that occasion.

Mr. W. Osburn cordially seconded the motion.

The Mayor, in putting the resolution, personally expressed his thanks to the noble lord, after which the motion was carried by acclamation.

The Earl of Shaftesbury responded, and the proceedings terminated at half-past ten o'clock.

During the evening Mr. W. Spark performed a selection of music on the organ.

LOCAL BOARDS AT LEEDS.

On Tuesday morning, at ten o'clock, a meeting of the Local Boards connected with the Young Men's Christian Institute, Mechanics' Institution, Yorkshire Union of Mechanics' Institutes, Holbeck Church Institute, and the Leeds Church Institute, was held at the Rooms of the Young Men's Christian Institute, Sir Thomas Phillips, Chairman of the Council of the Society of Arts, in the chair. Present:—Mr. Harry Chester, Vice-President of the Society of Arts; Rev. J. H. F. Kendall, Vicar of Holbeck; Rev. J. Blomefield, Incumbent of St. George's; Mr. W. Osburn, F.R.S.L.; Messrs. C. S. Spence, J. Pickering, B. Blake, J. Hole, J. Hamer, J. H. Hall. The object of the meeting was to endeavour to unite the several Boards into one body. Sir Thomas Phillips and Mr. Harry Chester, on the part of the Society of Arts, pointed out the importance of the several Boards uniting, and offered suggestions as to the constitution, object, and functions of the proposed Board; and resolutions were adopted recommending the various Institutions to unite together for the purpose of forming one Board. Another meeting is to be held in the Rooms of the Philosophical Society, when it is expected that the arrangements will be fully completed.

ON THE ACTION OF HARD WATERS UPON LEAD.

By W. Lauder Lindsay, M.D., F.L.S.

(*Concluded from page 725.*)

A friend in London has furnished me with the particulars of the erosion of a new cistern in his new house at Brompton; and similar cases are common in London. The cistern was roofed with wood; no rain-water entered it; the water supplied to the house was Thames water, from the Chelsea water-works,—a water which he describes to be regarded by laundresses as a soft water, compared with London pump or well water. This water, however, contains nearly 20 grains per gallon of solid matter, 16½ grains consisting of carbonate of lime, and 3 of sulphate of lime and chloride of sodium; while oxide of iron, silica, magnesia, and carbonaceous matter exist only in minute proportions. There soon appeared, and there continued to be, a copious white sediment on the bottom of the cistern. He made a practice of cleaning out the cistern once a-year; and in about five or six years he found the lead fast becoming eroded over the spots most copiously covered by the white deposit. The remedy he resorted to was plugging the erosions or leakages with gutta percha.

The case related by Dr. Wall, of Worcester*, and quoted by Dr. Christison,† is worthy of record here. A family, consisting of parents and 21 children, were constantly liable to stomach and bowel complaints; 8 children and both parents died in consequence. The house was sold after their death, and the purchaser found it necessary to repair the pump, the cylinder and cistern of which were riddled with holes, and as thin as a sieve. The plumber employed informed Dr. Wall that he had repaired it several times previously. Unfortunately, no analysis was made of the water, and we are left to infer that it was hard, from the fact that most of the water about Worcester is hard. This, however, does the reverse of account for its action on lead: hence the cause in this case was supposed to be one of the three following:—1. An unusually small proportion of salts; 2, An excess of carbonic acid; or 3, "Which is perhaps fully more probable, the corrosion was the effect of some obscure galvanic action!" Now it is doubtless very convenient to ascribe or attribute cases, otherwise inexplicable, to "obscure galvanic action;" but it is just to the rationale of this, and similar obscure actions of water on lead, that I am desirous of directing the attention of chemists. Many cases similar to that given by Dr. Wall are on record; but they are comparatively valueless, from the want of an analysis of the waters concerned. It is extremely desirable that in all future records of cases, there should be given some key to the character of the water. If nothing further can be stated or ascertained regarding it, the narrator would do service by mentioning whether it is hard or soft—whether it curdles soap, or forms a lather therewith. Dr. Christison says,—"Of spring waters, which act with inconvenient or dangerous rapidity on lead, several instances might be quoted. But it is hardly worth while mentioning more than one or two by way of illustration: because the nature of the water has been very seldom described so carefully as to supply the means of explaining their operation."‡

It may be asked, in the case of cisterns so eroded, and which must continue to contain the same kind of water, how is the tendency to erosion to be obviated? In the cisterns mentioned at p. 10, it was obviated, after repeated solderings and patchings, by coating the lead with a composition of rosin and tallow, which has answered the desired purpose admirably. This is the common mode of rectifying the mishap in this quarter (Perth). Plumbers, then, use a very suitable mechanical means of protecting the lead; but a very ingenious chemical means has also been recommended by several distinguished authorities. It has been found that different neutral salts protect lead from the corrosive action of water with different degrees of efficiency—chloride of sodium in the proportion of $\frac{1}{2000}$th, and sulphate of lime in that of $\frac{1}{4000}$th. Of these, one of the most powerful is phosphate of soda, a small quantity of which added to a water, prevents its action on lead. Hence it has been recommended to add to a water which is, or is supposed to be, corrosive of lead, a given proportion of this salt (about $\frac{1}{25000}$th part). Professor Christison has pointed out that this so-called "preservative powder" depends on, or resides in, the acid, and not the base, of the salt. For instance, the sulphates of soda, magnesia, and lime, as well as the triple sulphate of alumina and potash, preserve, as nearly as can be determined, in the same proportion. In regard to their relative preserving power, it is found that salts, whose acids form with lead a soluble salt, are least energetic, and *vice versa*.* Other mechanical means might be suggested to remedy the evil complained of,—such as the substitution of cisterns of other metals, or of wood, earthenware, glass, or gutta-percha. Or the lead may be lined with gutta-percha, india-rubber, or other materials. But my object at present is merely to indicate fully the evil, not to suggest a remedy.† For an illustration of the deleterious effects on the human system of hard water contaminated with lead, I am indebted to the kindness of a lady in Derbyshire, in whose household the following incident occurred.[*]

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* Transactions of London College of Physicians, ii. 400.

† Treatise on Poisons, 1835, p. 488.

‡ Treatise on Poisons, 1835, p. 488.

* Treatise on Poisons, 1835.

† From communications received in relation to the above paper, as it was laid before the late meeting of the British Association, I find that my ideas regarding the coating of the interior of lead pipes and cisterns with substances on which water exerts no action, or at least, no deleterious action, have been anticipated by the patents of Mr. E. K. Davis, of 42, Tenison-street, York-road, Lambeth, London. The lead he manufactures and lines he guarantees to resist the action of waters of all sorts, as well as of beer and similar fluids; and his patents extend to England, France, and Austria. The essential principle of his patents is simply the lining or coating of the lead with substances not acted upon by water, beer, or other fluids, and which cannot, therefore, confer upon such fluids poisonous or deleterious properties. The materials he uses are various, specimens of which I have had an opportunity of examining for myself through the kindness of the patentee. I have accordingly every confidence in recommending Mr. Davis's patents to the notice of all who are charged with, or concerned in, the conveyance or storing up of water, beer, &c., for culinary or drinking purpose. The materials Mr. Davis uses are chiefly of two classes, viz.:—1. Pure tin. A special machinery is applied; the lead pipe or sheet is operated on in a solid state, but at a heat above the melting-point of tin. The fused tin and lead are firmly united, it being easy to make the coating of any desired or desirable thickness. If the coating be comparatively thick, then there is virtually a double cylinder or tube,—the outer or thicker being of lead the thinner and inner of tin. It is perhaps necessary to explain here that such pipes are quite different from what are known to plumbers as "tin-coated pipes." In the latter case, the coating is very thin, and consists of what is termed "fusible metal,"—a mixture of lead, bismuth, and tin. 2. Compositions of various gums, resins, gutta-percha, caoutchouc, bitumen, and similar materials, selecting such only as form an adhesive and flexible film, which will not be ruptured or abraded by the processes of bending and otherwise manipulating the lead. The specimens of pipes I have examined are first coated internally with a composition of several of the materials just named, and subsequently lined by a film of gutta-percha. Gutta-percha or caoutchouc cannot be directly applied as coatings, from their non-adhesiveness to metal when precipitated from their solutions But they adhere firmly to a surface of any of the compositions prepared by Mr. Davis. In reference to Mr. Davis's patents, the *Builder* remarks:—"The most hopeful and efficient remedy, however, now practically available, appears to be that provided under a patent secured by Mr. E. K. Davis, of Lambeth, for the coating (amongst other processes) of the interior of leaden water-pipes with a thin film, or inner tube of tin, or of compositions of gum-lacs and india-rubber or gutta-percha, in a soft or fluid state, by means of improvements in the usual

"Mr. B——, the gentleman who acted as tutor to our children last year, came to us soon after Christmas. He had previously been in perfect health, so far as regarded the digestive organs, although the localities in which he had been residing—Edinburgh during the college session, and Glasgow as his home—did not offer any peculiar advantages in this respect. Soon after his arrival he complained of dyspepsia in no ordinary degree. The usual remedies had no effect. A strict system of diet proved equally inefficacious. After exhausting the skill of our country practitioners, he went to Manchester to seek for relief there. Mr. —— a surgeon of large practice there, after a careful investigation of his mode of life, his symptoms, &c., told him that he could not account for the attack except on the supposition of lead being held in solution by the water. Mr. B—— objected that he was the only invalid in a family of nineteen, and that he believed the water was from a spring, and conveyed to the house by iron pipes. Mr. S—— rejoined that the conditions of his ordinary life were so favourable to health, the hours of the meals so appropriate, and the remedies which had been used so fitted to benefit a case of pure indigestion, had there been no irritating cause, continued that the presence of lead in the water offered the only solution of the difficulty. On his return, we drew four bottles of water from four different taps within the house, and sent them to Professor —— for investigation.

"The origin of the water with which we are supplied is rather singular. Far up on a high hill two springs, within ten or twelve feet of each other, rise, and mingle their water a few yards lower down. One of them is excessively hard; the other is equally soft. Both flow together into a reservoir; thence filtering through gravel, they pass into iron pipes, which, descending into a deep valley, and crossing it, rise again to the hill on which our house is situated. It is carried up to the very top of the building, and is there deposited in a lead cistern, from which some leaden pipes lead it down to the butler's pantry and the place from which we used to get our drinking water. The kitchens, &c., were supplied from the iron pipes before the water ascended to the top of the house. The house is very large, and the roof is flat. The cistern occupies a large space on the top, and is, of course, exposed in its full extent to the air.

"Professor —— detected lead in the two taps leading from the cistern; the other two he declared to be perfectly free from it. The bottles were simply labelled with initial letters. We were very incredulous, and, on expressing our disbelief, he asked us to send the water again differently labelled. The result was the same as before. We immediately removed the filter to one of the kitchen pipes (the water from) which had been declared to be free from lead. In a short time Mr. B. was decidedly better: he looked very much better, his colour clearer, and his whole appearance improved; but he said he still felt occasionally some touches of his old complaint, although nothing in comparison to what he formerly endured. He has gone to Glasgow for the holidays, and wrote to me the other day that 'he ignores the very name of indigestion.'"

In a subsequent letter,[*] explanatory of some details the same lady informs me:—"We consider the water hard, although, as I mentioned before, there is a soft spring mingled with the hard one. . . . . Lead was found in this hard water after it had been conveyed into a leaden cistern and distributed thence in leaden pipes through part of the house. No trace of lead was found in the same water, which was also in the house, but flowed through iron pipes only."

According to the analysis of Professor ——, the water drawn before it entered leaden pipes or cisterns contained of

Organic matter, per gallon	....	3·50 grs.
Inorganic ,,	....	11·37
		14·87

The latter consisted of the following salts:—

1. Potash.—*a*. Chloride—very small quantity.
   b. Sulphate—a trace.
2. Lime.—*a*. Sulphate—rather abundant.
   b. Carbonate—small quantity.
3. Magnesia.—*a*. Chloride—rather abundant.
   b. Sulphate—small quantity.
   c. Carbonate—small quantity.
4. Iron.—*a*. Carbonate—very small quantity.
5. Ammonia.—*a*. Nitrate—a trace.[†]

The analyst designates the water "very soft," and reports it as fit for all domestic purposes, in the absence of lead; while Mrs. B., in her letters above quoted, repeatedly speaks of it as hard! It is now well-known that the quality of hardness in water does not depend merely on the amount of its saline ingredients, but chiefly on their kind or nature. Professor Graham points out that some London waters are soft, though containing as much as $\frac{1}{1240}$th of solid matter.[‡]

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machinery for making leaden pipes themselves. The coating appears (in pieces of the various tubes which we have purposely examined) to be perfectly adherent, of quite sufficient thickness, and otherwise efficient in its formation for the purpose in view." "The mechanism by means of which these and other processes are effected is ingenious; and the patent of Mr. Davis comprehends various improvements,—such as a double-action hydraulic press, the casing of soft metal pipes with block-tin and other metals, the forcing of soft metals by compressed air, the plating of sheets in a way described, the making of dies for coating lead and other pipes with other metals, a mode of making still-worms, the coating of soft metal pipes with gutta-percha, india-rubber, &c., and various other improvements. It is with special reference to a remedy for the contamination of water by lead that we have examined the pipes coated under this patent; and we think it well deserves the public patronage, as tending towards the realisation of that very desirable end." The London plumbers, who are familiar with the fact that new cisterns in London houses are frequently eroded to the extent of leakage in the course of one or two years, usually apply as a remedy a coating composed of rosin, white lead, and grease! This, it need hardly be observed, is a most objectionable remedy compared with the substances enumerated in Mr. Davis's patents. Dissolved india-rubber has, however, been applied to a similar purpose; and it has been suggested to me by an ingenious correspondent that a varnish of coal-tar, which dries hard and fast, and is deemed a most serviceable coating for exposed iron and other metallic work, might also be used.

[*] Narrative contained in letter dated 14th July, 1858.

[*] Of date 2nd August, 1858.

[†] Date of analysis, October 10, 1857.

[‡] At my request, two beer bottles full of the waters in question,—the one specimen (No. 1) drawn from lead pipes passing through a lead cistern containing the water, and the other (No. 2) taken from iron pipes, the water not having in this case been at all contained in, and not having passed through, leaden vessels, were kindly sent to me for analysis in the beginning of August last; but I was unable to overtake their examination till the 20th of September. My results were as follows:—No. 1 had, on drawing the cork, a distinct smell of sulphuretted hydrogen; and the water contained a quantity of brown flocculent matter, apparently derived from the cork. A stream of sulphuretted hydrogen was passed through the water, both in its original state, as received, and after it had been greatly concentrated by evaporation. Not a trace of lead was discovered by this or any other process applied; neither was iron detected by the rough qualitative methods employed. There was a small proportion of sediment on evaporation. Carbonates were comparatively abundant; chlorides and sulphates in very small quantity; lime and magnesia were plentiful, the former especially.—No. 2 also had a slight smell of sulphuretted hydrogen. The water gave precisely the same reactions as No. 1, except that the sulphates and carbonates were rather more abundant.

I was recently informed by a friend in London, who formerly lived in Brompton, that he constantly or repeatedly suffered from anomalous stomach complaints while he resided there, and which he attributed solely to the water with which his house was supplied being contaminated with lead; of this, however, he had no chemical proof. The water he described as hard: it was supplied by one of the London water companies,—the water furnished by all of which contains, in comparison with the waters of Edinburgh and Aberbeen, large quantities of solid or saline constituents. He only got rid of his symptoms by removal to Clapham, where the water supply is derived from a garden-well, sunk in the gravel of the London basin. This water also is described as hard; but it is not contained in leaden cisterns, nor does it pass through leaden pipes. This same gentleman, who is connected with the Metropolitan Board of Works in London, and who has an ample experience of such matters, informs me that such cases are very common in London, —so common, indeed, that he laughed at the idea of hard waters protecting lead.

I will now briefly review the various theories or explanations that have been, or that may be, advanced to account for the action of spring waters, which are generally more or less hard, upon lead. They may be tabulated as follows:—

1. Unusually small quantity of
    a. The neutral salts generally, or in the aggregate.
    b. Particular neutral salts, such as the carbonates and sulphates.
2. Unusually large proportion of carbonic acid in the water.
3. The presence of acids derivable from decaying vegetable or animal matter.
4. Presence of foreign bodies or accidental impurities.
5. Presence of nitrite of ammonia.
6. Presence of atmospheric air in the water, perhaps in unusual amount.
7. Use of leaden covers to cisterns.
8. Long exposure of still water to the same surface of metal.
9. Great extent of surface exposed.
10. Galvanic action from the contact of different metals, or of different qualities of the same metal, under water.
11. Chemical or electro-chemical causes, with which we are at present unacquainted.

With a knowledge of the statements of Professor Christison as to the power of the neutral salts generally to protect lead from the corrosive action of water, it is unnecessary to illustrate the first half of the first proposition or cause above tabulated, because a water deficient in such salts approaches the characters of rain or distilled water. And further, with a knowledge of what has been determined in regard to the different protective powers of particular neutral salts, it is easy to comprehend how a water containing abundance of chlorides, but a minimum of sulphates and carbonates, should act upon lead nearly as readily and rapidly as if there were an absolute deficiency of all neutral salts.

Professor Daniell says that all waters will corode lead if they contain excess of carbonic acid. "My friend, Professor Daniell," says Dr. Pereira, "informs me that he has found lead in the well-water obtained at Norwood. The water is very hard (that is, holds a large quantity of sulphate of lime in solution), and contains much free carbonic acid. It is the latter ingredient apparently which holds the lead in solution; for, by boiling, the whole of the lead is precipitated. The water is raised from the well by a leaden pump, to which is (?) attached a few feet of leaden pipe. Professor Daniell's attention was directed to the subject in consequence of the occurrence of several cases of lead colic in the neighbourhood of his residence at Norwood."[*] Professor Taylor opposes the statement, that carbonate of lead is at all soluble in water charged with carbonic acid. "It has been supposed," says he, "that carbonic acid contained in water would partially dissolve and suspend the carbonate in it; but in saturating water with carbonic acid, over finely-divided carbonate of lead, it was not found, on filtration, that any perceptible portion had been dissolved."[†] "Natural water," says Professor Fownes, "highly-charged with carbonic acid, cannot, under any circumstances, be kept in lead or passed through lead pipes with safety; the carbonate, though very insoluble in pure water, being slightly soluble in water containing carbonic acid."[‡]

It has been supposed, and with every prospect of the supposition being correct, that the presence of decaying leaves and similar organic matters, whether of vegetable or animal origin, may favour the corrosion of lead by the development of various acids due to the gradual decomposition of such organic matters. Pereira mentions a case in which a fragment of mortar appears to have aided or determined the corrosive action of the water.

"The presence of nitrite of ammonia in water," says Dr. Medlock, "I have clearly established by the most conclusive experiments; and it is to the presence of this substance, both in distilled waters and waters selected for domestic use, that the action of such waters on lead is due. The nitrous acid attacks the lead and forms the soluble nitrite of lead, which, by exposure to air, combines with carbonic acid, and precipitates the oxide of lead in the form of insoluble carbonate of lead, setting free the nitrous acid again to attack and dissolve a fresh portion of lead."[§]

It has been suggested that the presence of an unusual amount of atmospheric air in water would favour or facilitate its action on lead. Doubtless it would do so were it proved to exist, but this cannot be an important element or agent in the action in many cases. The presence of air externally to the water is as much an essential to the action as is that of the water itself; for, unless there is free exposure to the air, oxidation and the subsequent changes in the metal will not proceed. Water is well-known to be capable of holding in solution a considerable proportion of air and other gases. Rain-water, remarks Professor Christison, generally contains 2¼ per cent. of its bulk of air, in which the proportion of oxygen gas is so high as 32 per cent. In water from freshly-melted snow the proportion of oxygen is 32·8 per cent., according to the observations of Gay-Lussac and Humboldt, while the oxygen in atmospheric air does not exceed 21 per cent.[‖] Professor Christison has also pointed out that distilled water deprived of its gases by ebullition, and excluded from contact with the air, has no action on lead.[¶]

It will be observed that there is some discrepancy between the analysis originally made by an English chemist and my own results as just given. This is not to be wondered at, when we consider the changes in the composition of waters produced by season, rainfall, drought, &c. A fall of rain, for instance, must greatly modify the composition of waters, especially if they are derived from the surface drainage of an agricultural district. The tables furnished by Dr. R. D. Thomson, of St. Thomas's Hospital, London, and published in the reports of the Registrar-General of births, deaths, &c., show distinctly the difference in the composition, from month to month, of the same waters, supplied by the same metropolitan water companies, and derived from the same sources. Dr. Medlock remarks,—"It not unfrequently happens that a water which, at one season of the year, acts vigorously upon lead, has no action upon it at other seasons." *(Ol. citat. p. 33.)*

[*] A Treatise on Food and Diet. By Jonathan Pereira, M.D., &c. P. 96. London, 1843. See also Morson, in Pharmaceutical Journal, November 1, 1842.

[†] On Poisons. London, 1848. P. 450. "Water Poisoned by Lead."

[‡] Manual of Elementary Chemistry. London, 1856. P. 333.

[§] On the Action of Certain Waters upon Lead. Record of Pharmacy and Therapeutics, Part II. London, 1857. P. 34.

[‖] Trans. Roy. Soc Edin., Vol. 15, Part II., p. 271.

[¶] Treatise on Poisous, 1835, p. 476.

The use of leaden covers to cisterns is fraught with great danger, and fortunately is comparatively seldom resorted to by plumbers. If cisterns are covered at all, probably the safest material is wood. However impure or hard a water is, however saturated with sulphates and carbonates, and however free from plumbeous impregnation, the moisture which results from its evaporation, and which condenses on the lead cover, is pure or distilled water. Hydrated oxide and carbonate are produced in the ordinary way; these gradually encrust the lead, and by-and-by scales or fragments fall off and drop into the subnatant water, in which they are partly dissolved, partly held in a state of suspension.

Time is a most important element or condition in the action of water on lead. The mere flowing of water through leaden pipes, and the standing of water for a long period in leaden cisterns, are two very opposite conditions. Accordingly, it is found that the same water which will cause no perceptible change on lead from short contact, will produce a copious deposit of oxide and carbonate on standing for some weeks or months. Professor Christison remarks this in regard to Edinburgh water, which contracts no material impregnation after a few days' contact. A cistern in his laboratory in the University of Edinburgh was left undisturbed for five or six months with a few inches of water in it. After the lapse of this period, he found "so large a quantity of pearly crystals lying loose on the cistern, and diffused through the water, that, when the whole was shaken up and transferred to a glass vessel, the water appeared quite opaque."* I believe that such is the action of Edinburgh water,—a water containing about 12 grains per gallon of solid matter,† that in the course of ten days or a fortnight, while at rest in contact with lead, it will dissolve the metal to the extent of about $\frac{1}{500}$th of a grain at least per gallon. Professor Christison again remarks, —"Neither ought ordinary terrestrial waters to be kept very long in leaden vessels; because the same changes, though not appreciable in a few days or weeks, are nevertheless accomplished in the course of time."‡ The late Dr. Thomson, of Glasgow, says, when he lived in Edinburgh, he "could always detect a minute trace of lead suspended in the water, which at that time was brought six miles in leaden pipes."§

An equally important element in the action is perhaps the extent of surface exposed. It not unfrequently happens that experiments on the small scale give erroneous, and consequently dangerous, results, merely because the surface exposed was too small and the time allowed too short. Professor Christison gives an apt illustration. A gentleman in Dumfriesshire had resolved to introduce into his house, through leaden pipes, the water of a spring some three-quarters of a mile distant. But, with a view to ascertain whether it was quite safe to do so, the usual experiment was made, of placing a few freshly-scraped or polished leaden rods in contact with the water for a few days. At the end of a fortnight, the result was imperceptible; from which it was forthwith concluded that this water might be conveyed through lead pipes and stand in lead cisterns with all safety.|| The works were immediately carried out; but the results were as dangerous as they were unexpected. The water was soon found to be impregnated with lead to such a degree as to be opalescent. Analysis showed the water to have been extremely pure, containing not more than $\frac{1}{22000}$ of saline matters, which consisted mainly of sulphates, chlorides, and carbonates. Here the unintentional experiment with 784 square feet of lead produced very opposite results from that with a few inches!*

Galvanic action in connection with the corrosion of lead seems to me to be a most hopeful field of research. It is generally called into requisition to explain all anomalous cases of the action of hard waters on lead. But this is making too much of it. I have no doubt that it exerts a powerful influence in many cases, but it has yet to be distinctly shown in what cases, how and under what circumstances, it operates. The subject is by no means new. Dr. Paris long ago drew attention to it, and it has also been taken up by Professors Christison and Pereira; but it is still, to say the least of it, very imperfectly understood. I would therefore strongly recommend it to the study of chemists and electricians. The contact of other metals with lead, the use of solder, the mere existence of impurities or inequalities in the lead, seem to determine galvanic action; in which event the lead "becomes more susceptible of, and exposed to, the agency of electro-positive elements, among which are alkalis and alkaline earths, and these exert considerable solvent power over it."† "Galvanism," says Professor Christison, "is a most co-operating agent, or rather, perhaps, it should be considered a distinct power, for it acts with energy where water alone acts least,—viz., where there is saline mater in solution, because then a galvanic current of greater force is excited. . . . Even inequalities in the composition of the lead may have the same effect. Sheet-lead, long exposed to air or water, is sometimes corroded in particular spots; and these will always be found in the neighbourhood of parts of the metal differing in colour, hardness or texture, from the general mass. This, however, is a mere supposition; but it affords ready explanation of the corrosion. Similar effects may arise simply from fragments of other metals lying long in contact with lead. . . . I have no doubt that many of the instances of unusually rapid corrosion of lead by water,—such as that mentioned by Dr. Wall, are really owing not to the simple action of water, but to galvanic action, excited obscurely in one or other of the ways now mentioned."‡

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* Treatise on Poisons, 3d edit. 1835, p. 491.

† As a comparative statement, I may here mention that, in round numbers, the water of Glasgow,—supplied from Loch Katrine,—contains from 1 to 2 grains per gallon of solid matter; that of Aberdeen 2 to 4; and that of London from 15 to 30!

‡ Dispensatory, 2d edit. 1848. Art. *Plumbum.*

§ Christison's Treatise on Poisons, 1835, p. 487.

|| "Water, which tarnishes polished lead when left at rest upon it in a glass vessel for a few hours cannot be safely transmitted through lead pipes without certain precautions. Conversely—it is probable, though not yet proved, that if polished lead remain untarnished, or nearly so, for twenty-four hours in a glass of water, the water may be safely conducted through lead pipes."*a* Taylor, too, regards the freshly-scraped piece of lead as a good test of the absolute purity of distilled water; and conversely, of the liability of water to poisonous impregnation with lead. If the fresh metallic surface, says he, remain bright after some days, or only acquire a faint incrustation of sulphate, and if sulphuretted hydrogen does not give a brown tint to the water there is but little danger of its becoming poisoned with lead.*a*

a Christison, Trans. Roy. Soc. Edinb., vol. xviii., part ii., p. 271.

a On Poisons, London, 1848, p. 450—"Water poisoned by lead."

* Treatise on Poisons. 3d edit. 1835, p. 489.

† Pereira on Food and Diet, p. 97, and Brande's Dict. of Mat. Med. and Pract. Pharmacy, p. 80. London, 1839.

‡ Treatise on Poisons, pp. 494-5.

In the discussion following the reading of this paper at the British Association, several interesting illustrations were given of corrosive action on lead and copper, attributable or supposed to be attributable, to galvanic action. For instance (I quote from a Leeds newspaper), "a member said that when copper sheets from different factories were joined together to cover the bottoms of ships, strong galvanic action was set up when they were immersed in sea-water. When all the sheets on the bottom of the ship were of the same kind of copper, the corrosion was very slight. As lead was affected in a similar manner, the sheets of that metal used for lining cisterns ought always to be of one kind." Dr. Edwards attributed the different action of the same water on different lead cisterns to the fact that some sheets of that metal were made from old lead, containing an admixture of solder, which caused it to be corroded by galvanic action. It was shown that thirty or forty years ago, cisterns were not so much acted on

In the course of a lecture on "Public Health," delivered in the City Hall, Perth, on the 4th January last, Dr. Stirling, of Perth, made the following statement in regard to the influence of galvanic agency in determining the corrosive action of various waters, containing saline matters, on lead:—"Having compared the effect produced on lead rods immersed in solutions of various neutral salts, in distilled water, with that produced on similar rods in contact with copper wire, immersed in solutions of the same salts, and of the same strength, I am led to the following conclusions, viz.—1. That galvanic action is a most powerful agent in promoting the corrosive action of certain waters upon lead; 2. That, in water containing a small proportion of certain feebly protective salts, galvanic action is slightly, if at all produced; 3. That, in water containing the same salts in so large quantity as to be considered protective to the metal, galvanic action is so powerfully induced as to render the water, instead of innocuous, nearly as corrosive as the very weak solution; 4. That, in water containing certain powerfully protective salts, galvanic action is sufficiently produced to render it doubtful whether any saline solution can altogether protect lead from corrosive action, when, from the nature of the containing vessel, or other cause, galvanic currents may be induced."

Lastly, there are perchance other chemical or electrochemical causes, whose action is presently unknown or imperfectly understood. These I leave with confidence for investigation in the hands of the Chemical Section of the British Association; for on such causes or their action I am not prepared to throw any light.

I firmly believe that cases of lead poisoning on the small scale, or rather, I should say, in a minor degree, are constantly occurring in all our large towns, from the plumbeous impregnation of drinking-waters. The medical man is often extremely puzzled to account for certain anomalous symptoms in his patients; and he puzzles himself in vain, until he at last bethinks himself of the assistance of the chemist, who discovers lead in the drinking-water used. Attacks of lead colic—isolated or endemic—are frequently the first circumstance to attract attention to the state of the water supply. On talking over the matter with medical men in London and elsewhere, I find the suspicion strong, though they are seldom in a position to prove indubitably the correctness of their suspicion, that many obscure cases of colic and other intestinal affections, as well as of paralysis of the nature of lead palsy,—sometimes going on to a fatal issue,—are really due to plumbeous impregnation of drinking-waters; and under so many different circumstances do such cases occur, that in a large proportion at least, the water so impregnated must be hard in the sense in which I have used that term. In all cases of obscure colicky or paralytic complaints,—especially if it be found that several persons are simultaneously affected,—the condition of the water supply should be diligently inquired into, with a special view to the presence in it of lead. Dr. Robertson, of Manchester, remarks,—"What I would here advert to is the custom, so general in England, of using lead cisterns for storing water, especially where, as in many of our towns, the supply is intermittent. Such cistern water is always tainted with lead, not in quantity, it may be, to produce the distinguishing symptoms of lead poisoning, but enough to affect very injuriously the stomach and nervous system of persons habitually using it."*

For the benefit of those who may be desirous of following up the subject of the foregoing remarks, I beg to append, in a collected form, a few bibliographical notes:—

Professor Christison of Edinburgh:
  1. Treatise on Poisons. 3d edit. 1835. Edinburgh.
  2. Dispensatory. 2d edit. Edinburgh, 1848.
  3. Paper in Transactions of Royal Society of Edinburgh. Vol. XV., Part II., 1842.
Professor Pereira:
  1. A Treatise on Food and Diet. London, 1843.
  2. Elements of Materia Medica and Therapeutics, 3d edit. London, 1849.
Professor Taylor:
  1. On Poisons. London, 1848.
  2. Guy's Hospital Reports. No. VI., O.S.
Dr. Wall, of Worcester: Transactions of London College of Physicians. II. 400.
Dr. Scudamore: Analysis of the Water of Tunbridge Wells. 1816.
Dr. Thomson, of Glasgow, in Appendix to above. Also in Edinburgh Medical and Surgical Journal, Vol. XII.
Dr. Lambe of Warwick: Researches into the Properties of Spring Waters. 1803.
Dr. Yeats: Hints on a Mode of Procuring Soft Water at Tunbridge. Journal of Science, XIV. 352.
Vitruvius: De Architectura. L. VIII., c. 7. Quot modis ducantur aquæ. Ed. Dan. Barbari, 1567, pp. 262–5.
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Wood and Bache: The Dispensatory of the United States of America. 3rd edit. Philadelphia, 1836.
Professor Graham: Elements of Chemistry. 1842: and Vol. II. London, 1858.
R. Phillips, in Report from the Select Committee of the House of Lords appointed to inquire into the Supply of Water to the Metropolis. 1840.
Dr. Bostock, in Report of the Commissioners appointed to inquire into the State of the Supply of Water in the Metropolis. 1828.
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Dr. Medlock: "On the Action of certain Waters upon Lead:" Record of Pharmacy and Therapeutics of General Apothecaries' Company, London. Part 2. 1857.

BRITISH ASSOCIATION, ABERDEEN, 1859.

The following papers were read in the Mechanical Section:—

On Smokeless Coal-Burning in Locomotive Engines.

By D. K. Clarke.

The substitution of coal, as fuel, for coke in locomotives, is not only felt to be a commercial necessity for the reduction of expenditure, but is also discovered to be perfectly practicable as a mechanical problem, in conformity with the conditions laid down in the Railway Acts of Parliament, that railway engines shall consume their own smoke. The means of doing so, to be acceptable to a

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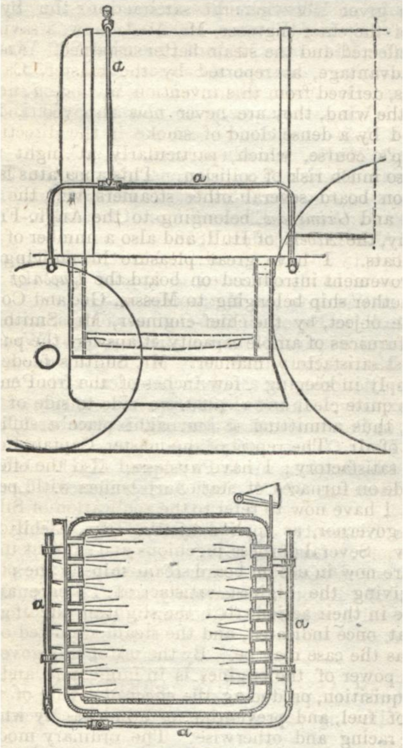
by water as now; and it was probable that this was owing to the fact, that the silver in lead was now extracted, whereas formerly it was not worth while to do so. The long corroded streaks which were often observed in sheet-lead were caused by galvanic action set up by small portions of tin which had been attached to old lead." "The Rev. W. V. Harcourt could not understand how the presence of silver in lead could affect it much, considering the electrical relations the two metals bore to each other. In his opinion, it was advisable to use leaden vessels for holding water as little as possible, for it was clear that health was in constant danger from it."

* A Few Additional Suggestions with a view to the Improvement of Hospitals. By Mr. John Brotherton. [Reprinted from the Transactions of the Manchester Statistical Society. Read March 31, 1858.]

locomotive engine, must be simple in design, facile of application to existing locomotive stock, easy to manage, easy to maintain, efficient in promoting the combustion of coal without smoke, keeping up the steam, and saving expense.

These desirable qualifications, the writer believes, belong to this system of smoke prevention. The whole apparatus is external to the fire-box, and therefore not exposed to heat, and it is controlled in the most perfect manner by a single stop-cock. Air is admitted above the fuel by one or more rows of tubes inserted through the walls of the fire-box, and jets of steam are projected through the air-tubes from nozzles one-sixteenth inch in diameter, in small steam-pipes placed outside the fire-box, to increase the quantity and force of the air admitted above the fuel, in order to consume the smoke. The jets of steam are used principally when the engine is standing, with the aid of a light draught from a ring jet in the chimney, to carry off the products of combustion, and they may be shut off when not required. The supply of air through the tubes may also be regulated by dampers. The grate bars are placed close together, with narrow air spaces, and the ash-pan and damper are tightly-fitted. The level of the fuel should at all times be below the air-tubes.



a a, Steam-pipe.

This system is working, with entire success, on the engines of the Great North of Scotland Railway, at Aberdeen. It is also successfully at work daily (amongst other lines) on several of the engines of the North London Railway, where, as a metropolitan line, the regulations against smoke-nuisance are rigidly enforced. It requires a less weight of coal than the engines formerly required of coke for the same duty, and thus saves the whole difference in cost of fuel.

The locomotive engine has been variously cut up, in order to suit the views of designers for the combustion of coal without smoke. In the plan before the meeting, the original type of engine promulgated by Mr. Stephenson, and at this day universally adopted, and unsurpassed, is preserved intact; and the locomotive is thus rendered a complete and perfect machine, and entirely meets the great railway necessity of the day—the perfect combustion of coal in railway engines.

Some of the members of the Committee, through the kindness of Mr. Cowan, the Locomotive Superintendent of the Great North of Scotland Railway, had an opportunity of witnessing Mr. Clarke's system in action. The result of the trip was very successful. The smoke was most effectually got rid of, and the apparatus was under such control that smoke was got rid of or produced, by simply opening or shutting the valves. Mr. Cowan stated that he had had the apparatus working for some time, and could testify, not only to its efficiency, but to the saving in fuel effected by its use.

REPORT OF THE PROGRESS OF STEAM NAVIGATION AT HULL. By JAMES OLDHAM, M. Inst. C.E., Hull.

In continuation of my report on the progress of steam navigation, as connected with the port of Hull, I have to observe that, during the last two years, no very great change has taken place in the number of steamers, although I shall have to state some interesting facts occurring during that time. For generations past Hull has been noted for its Greenland and Davis Straits fishery, which for many years has constituted the chief feature of the port; and, at one time, upwards of sixty large ships were sent out, with crews varying from thirty to forty men each, and representing a capital for all that concerned the trade, of about £700,000 sterling. In 1818 Hull sent out to the fishery sixty-three ships, which brought home 5,817 tons of oil, and in 1820 sixty ships were sent out and returned home with 7,782 tons of oil, exclusive of whalebone. In this year (1820) the total number of ships at the fisheries, from England and Scotland, amounted to 156; and the entire weight of oil obtainedwas 18,725 tons, and of whalebone 902 tons. Owing, however, to the introduction of coal gas for the lighting of streets and buildings, and large importations of oils for manufacturing purposes from the Mediterranean and other places, together with the scarcity and difficulty of taking the whales, fish-oil became in a great measure superseded, and consequently the fishery nearly abandoned, and an enormous amount of property, once of so much value, almost entirely lost. Within the last two or three years steam has been put into successful requisition to aid the dauntless and hardy mariner in the pursuit of this hazardous calling, and now we have several screw steamships employed; and although some of them are fitted with comparatively small power, they have proved to be possessed of great advantage in the service, and in some instances satisfactorily to the owners. We have had two descriptions of steam-vessels employed in the fishery; the first the old wooden sailing ships, which had been engaged in the service for some years, but which were afterwards fitted with screw machinery an auxiliary steam power. The second, iron-built ordinary screw steam-vessels, but which proved, I believe, almost a total failure, the material of which they were built, and the want of strength for such a purpose, proving them altogether unfit to contend with the severity of the climate and rough encounters with the bergs and fields of ice; some becoming total wrecks, while others returned bruised and rent, and with difficulty kept from sinking. A question here arises how far iron ships are calculated to bear the severe frosts of high latitudes, and whether wooden-built vessels, with all their defects, are not the best adapted for encountering such a climate? The screw steam-ship which was first sent from Hull, or any other place, to the fishery as an experiment, was the *Diana*, timber-built, 355 tons, 40-horse power, high pressure, the property of Messrs. Brown, Atkinson, and Co., of Hull. The vessel had been some time engaged in the fishery as a sailing ship, but her spirited owners, thinking an important advantage could be gained, determined upon the adoption of steam power, and at once had the *Diana* fitted for the the spring of 1857, by Messrs. C. and M. Earle, who put in the engines and made the screw to lift out in case of need. The experiment fully answering their expectations, Messrs. Brown, Atkinson, and Co., bought the *Chase*, a fine American built ship, of immense strength, and of 558 tons. She was fitted by Messrs. Martin, Samuelson, and Co., with condensing engines of 80-horse power, and despatched to the fishery in the early part of 1858, and with good results. By the application of steam, ships in this service can now make a voyage first to Greenland, and afterwards to the Davis Straits. In the commencement of this year several ordinary iron screw steamers were despatched to Greenland, viz., the *Corkscrew*, *Gertrude*, *Emmeline*, and *Labuan;* the latter only of this class, which is the property of Messrs. Bailey and Leetham, had any success; but, in consequence of her great strength and peculiar form succeeded in a tolerable way; the others were much damaged, and, as I have already remarked, returned in bad condition. The *Labuan* is 584 tons burthen and 40-horse power.

The next point of interest connected with the steamships of the port of Hull refers to alterations made in some of the vessels. The *Emerald Isle*, a paddle timber ship of 1835, the property of Messrs. Gee and Co., originally $135\frac{8}{10}$ long, lengthened 35 feet, with a gain of 14 inches draught of water, and increased capacity for 100 tons dead weight. The *Sultana*, iron screw steamship of 1855, the property of the same house, originally 150 feet long, lengthened 30 feet, with a gain of 10 inches draught of water, and an increased capacity of about 100 tons. It is interesting to observe that in both cases we have no diminution of speed through the water, and that both vessels are improved as sea boats. Daily experience teaches the advantage gained, in almost every point of view, by ships of great comparative length. The iron steam-ship *Lion*, of Hull, formerly a paddle-boat, 249 feet long, but now converted into a screw-steamer by her owners, Messrs. Brownlow, Lumsden, and Co., under the direction of Mr. Anderson, their engineer, exhibits the great advantage gained by the alteration. Her register tonnage is 690, and the total tonnage 1,014. She was formerly fitted with steeple engines of 350 horse power, and had four boilers, two before and two abaft the engines; but these were substituted for direct action engines of 150-horse power, and two of her old boilers replaced, and by this alteration a clear length of hold in midships of 23 feet is gained. She required before the conversion 650 tons of coal for a Petersburg voyage, and consumed 30 cwt. to 40 cwt. per hour; but now 350 tons for the voyage, and a consumption of 20 cwt. per hour. By the change of machinery, about 130 tons of dead weight is removed from the ship, and she is now able to carry 400 tons more cargo. Her speed is also improved considerably; before the alteration, when drawing on an average 14 feet, the rate was six knots and a-half, but since the change, when drawing even more water, they can steam eight knots. Thus a saving in almost all the departments of the ship and other advantages, have been effected in this important change. During the last two years many fine steamships have been built in Hull, and others are in process of building for English and foreign service, by Messrs. Brownlow, Lumsden, and Co., Messrs. C. and W. Earle, and Messrs. Martin, Samuelson, and Co. The last named firm are making rapid progress in the building of two large iron paddle ships for the Atlantic Royal Mail Steam Navigation Company, of the following dimensions, power, &c.:—

	Feet.
Length between the perpendiculars	360
Beam moulded	40
Depth	30
Tonnage, builder's measure..........................	2,860
Nominal horse-power	800

These ships are to have three decks, and to be fitted fore and aft for passengers. Speed through the water, twenty miles per hour. They will be of immense strength, and their build and form such as to ensure their becoming fine sea boats. Since the meeting of the British Association, at Dublin, considerable advance has been made in London and other ports in the application of superheated steam, and, I believe, with great success and satisfaction in the results; Hull, however, is acting on the motto, *festina lente*, and before taking a decided step in this important discovery, is anxious to see and adopt the best mode of the application of the principle, being assured that in every onward movement it is better "to make no more haste than good speed." Some attention has been paid to the consumption of smoke in the furnaces of our steam vessels, and with a considerable amount of success. I may here mention the mode of Mr. Ralph Peacock, of New Holland, Hull, for which he has taken out a patent. It consists of a double furnace-door, the chamber or space between the inner and outer surfaces being five to six inches in width. The inner plate is perforated very full of small holes, and in the outer plate a revolving ventilator is inserted, which is on the principle of that invented by Dr. Hale, to supply close places with fresh air. The apparatus is in use on board the *Helen Macgregor*, one of Messrs. Gee and Co's. large sea-going steam-ships, and has given very general satisfaction; for by the report of the chief-engineer, Mr. McAndrew, a saving of fuel is effected and the steam better sustained. Another great advantage, as reported by the master, Captain Knowles, derived from this invention, is, that on running before the wind, they are never now annoyed and endangered by a dense cloud of smoke in the direction of the ship's course, which, particularly at night time, creates so much risk of collision. This apparatus is also in use on board several other steamers, viz., the *Yarborough* and *Grimshaw*, belonging to the Anglo-French Company, the *Albert*, of Hull, and also a number of river steam-boats. I have great pleasure in noticing also an improvement introduced on board the *Queen of Scotland*, another ship belonging to Messrs. Gee and Co., for the same object, by the chief-engineer, Mr. Smith, and having furnaces of ample capacity, it answers the purpose in a most satisfactory manner. Mr. Smith's mode consists simply in keeping a few inches of the front ends of the bars quite clear and clean from side to side of each furnace, thus admitting at the right place a sufficient amount of air. The report of the master, Captain Foster, is very satisfactory; I have witnessed also the effect of this mode on furnaces of stationary boilers with perfect results. I have now to refer to the application of Silver's marine governor, as applied by Mr. John Hamilton, of Glasgow. Several of these ingenious and efficient instruments are now in use on board steam-ships in the port of Hull, giving the highest satisfaction. There are so sensitive in their action, that the slightest pitching motion is at once indicated, and the steam admitted or excluded as the case may be. By the use of this governor, the full power of the engines is in immediate and constant requisition, producing the effect of saving of time, saving of fuel, and preventing of accidents by what is termed racing and otherwise. The ordinary mode, in the absence of the governor, is for the engineer in stormy weather and heavy seas continually to stand at the throttle-valves, or, to save himself this trouble, to throttle the engines, and thereby, when the full power of the engines is most required, it is frequently reduced to one-half or less, and consequently there is occasioned a loss of time on the voyage, and the risk of falling on to a lee shore.

The following is a brief statement of the tonnage, &c., of steam-vessels belonging to or trading from the port of Hull at the present time. 1st. Sea-going steamers belonging to the port, 22,290 tons register; horse power, 5,824. 2nd. River-steamers belonging to the port, 1,050 tons register; horse power, 450. 3rd. Sea-going steamers trading to Hull, but belonging to other ports—and although many changes have taken place—remain much the same as shown in my last report, viz., about 21,200 tons register; horse power, 5,300. 4th. River-steamers trading to Hull, but belonging to other places, 2,450 tons register; horse power, 1,200. The number and tonnage of sea-going vessels belonging to Hull have increased since my last report. The river-steamers belonging to the port remain nearly the same; this is also the case with sea-going and river-boats belonging to other places, but trading to Hull.

At the late meeting of the British Association, papers were contributed to the Chemical Section by four young men who attend the evening class of Practical Chemistry in the Museum of Irish Industry, Steven's-green, Dublin. This is an encouraging fact to the friends of adult education, and shows how much may be accomplished when the efforts made by industrious men are properly directed.

Home Correspondence.

EXHIBITION IN 1862.

Sir,—In the dedication to her Majesty of the series of lectures on the Great Exhibition of 1851, the subscribing Vice-Presidents and members of the Council of the Society of Arts state that "History does not inform us that any other sovereign of this country has ever shown so personal and affectionate a regard for the progress of the arts, sciences, and industries of the people as your Majesty—a fact which makes us hope that a continued and most auspicious development of them will be the consequence." Is the hope thus expressed to be realised? Is the Council of the Society of Arts again to have the credit of asking her Majesty's countenance and support to a second International Exhibition in 1862? Are the visible utterances of men's minds to be again collected and arranged for exhibition? Are the artists, manufacturers, and scientific men of England to be again urged to come forward and invite their foreign brothers and sisters in industry to a second trial of skill?

I trust that the present Council of the Society will take steps at once to induce so desirable an object, and enable tangible illustrations of the lessons learnt in 1851 to be placed before the world.

What better opportunity can be hoped for than the present? War, which threatened to involve Europe, has ceased. I know of no basis which could be laid so broadly, or which would enlist so large a sympathy as that upon which the property of nations is built, viz., a competitive display of industries. Are the working classes of England, who were taught their first lesson in competitive industry in 1851, not to have an opportunity of showing how they have profited by it? Much must have resulted—our exports have been greatly increased—these are the products of greater skill on the part of the artisan—and the results of the extended application of improved machinery.

England exports but little raw produce, and the wants of other countries, and the character of the articles they demand, can be more readily learnt by means of Exhibitions than in any other way. Can intellect meet intellect, skilled labour in England meet that from abroad, the produce of France be juxtaposed with that of England—the machinery of our workshops with the rude implements from the East—and no want be ascertained or requirement supplied? Have our colonies yielded no new raw produce? Is not India opening up to a greatly extended trade? Can England hope for no new imports and extension of trade with Africa? Are not the markets of Japan more freely open to us now than ever they were, and may we not hope that an Exhibition in 1862 would afford a display of the beautiful industries of that country, a display which in itself would teach lessons unthought of by many of our manufacturers, and which would react with great force upon the industries of this country?

Since the Council announced its intention to press forward an Exhibition in 1861, many of our colonies have arranged to hold preliminary Exhibitions, and show how readily they accept the offer to collect their products for exhibition in the markets of the mother-country. Are the advantages of such efforts to be lost to us for want of energy on our part? Russia, which is pushing forward so energetically, and establishing her workshops so largely throughout her empire, would doubtless become an important contributor.

Are there not ample grounds then for the Council to at once come forward and urge upon her Majesty and H.R.H., the President of the Society, the immediate declaration of an intention to realise as far as they can the hope set forward in the dedication above quoted, by holding a second International Exhibition in London in 1862? I am, &c.,

H. D.

Moorgate-street, Oct. 11, 1859.

THE WESTMINSTER BELL.

Sir,—In this age of improvement in England, it appears strange that the founding of large bells should be so little understood, and that the second Westminster Palace bell should so soon have proved a failure, like its predecessor, especially after all the care bestowed upon its re-casting by another founder.

In Belgium, within a twelve hours' journey from London, large bells are numerous, and were those of the Carillon Tower of Bruges examined, possibly the cause of the defect in our "Big Ben" might be ascertained. The great bell in that tower, upon which the hour has been struck for more than a century, was re-cast A.D. 1741, from those melted when the woodwork over the present tower was struck by lightning. The former bells were made by Melchior de Hoese, A.D. 1675. An older set of bells were first placed in this tower A.D. 1503, by Simon Waaghenlis, of Mechlin, these carillons being then recently invented at Alost, near Bruxelles. There are many large bells in this tower to complete the four octaves still perfectly musical. A larger number of bells are in the cathedral tower at Antwerp, and few are more perfect than those of Courtrai, and most of the principal towns have their carillons, which chime each quarter of an hour. Those of Bruges (considered the finest in Belgium), to which I particularly refer, are suspended on a massive wooden frame, and are struck externally by hammers, so balanced as to be raised by wires and catches, moved by metal pegs let into a brass cylinder, whereon four airs are set, as upon a barrel organ. A set of keys are also connected with these hammers, upon which professors usually play for an hour three times a-week, from noon till one, each Sunday, Wednesday, and Saturday, enlivening the inhabitants with the recent music of the day. Some of the large iron hammers appear to be coated with some softer material where the bell is struck. There is one bell (La Cloche de Notre Dame) which was brought from that tower many years since, and placed by itself in a lower room, which is swung, and tolled on days of fêtes and rejoicings: this is said to weigh 36,000 lbs.

The bells of the cathedral (Saint Sauveur), that were partly melted about twenty years ago, were recast in pits dug in the churchyard, and have been tolled ever since put up. The rich deep tones of these bells, and of the churches of Notre-Dame, Saint Jacques, and Saint Gilles, are peculiarly solemn and grand when sounded for mass on Sunday mornings.

In reading the account of the first "Big Ben," I noticed a great disproportion between the thickness of the head and the sound bow, as compared with the relative diameters, and it struck me that the vibrations could not be in harmony. I have not seen the measurements of the second casting, but I would suggest whether, if the same relative thickness was adhered to, the disproportion might not in some way account for the disaster.

Would it not be worth while to let some competent persons measure the large bells as well as their hammers, and seek information from those which have been so long in use at Bruges.

Now, assuming that the Westminster bell (taking Warner's card for authority) was 50 or 55 inches diameter at the head, the metal was stated to be three inches thick, and at the mouth 100 or 110 inches, the sound bow above should not have exceeded 6 inches in thickness, whereas it was stated to be 9 inches, which must affect the vibrations.

As many bells are indented where struck by clappers or tongues, the revolving head was an ingenious provision for bells rung in our violent English fashion, but "Big Ben" was only intended to be quietly suspended from a beam, and struck upon one point, so possibly a boss (ornamented) would have sufficed to receive the stroke of the hammer, without affecting the sound of the proportionate thinner ring, or necessitating this great increase of thickness. At any rate, before we recast poor "Ben," let us obtain some more practical information from our neighbours than we possess at present.

I am, &c.,
R. DENNIS CHANTRELL.

MODERN NAVAL WARFARE.

SIR,—Modern ordnance has now necessitated reformation in naval construction as a matter of such importance, that I presume good service may be rendered to public interest by renewing, simultaneously, attention to the following communications which appeared in the *Times* of the 12th January last and 7th October inst. :—

(*Times*, 12th Jan., 1859.)

TO THE EDITOR OF THE "TIMES."

SIR,—Many suggestions have of late been brought before the public on the construction of gun-boats, mortar-boats, and floating batteries, with a view to make them invulnerable; and I now beg to add my views on that subject. Why not make the floating body for such special services, up to the line of its load displacement, a solid mass of material, of such specific gravity lighter than water that it shall not sink, however much it may be perforated by shot? It appears to me that a solid combination might be made of cork shavings, light wood sawdust, rush stems, cotton waste, flocks, hemp, and other light material, which, by the aid of a solution of gutta percha, or other chemical process, would form a solidifying mass, so tough that it could not be knocked to pieces by shot, and so light that it would be only one-half the specific gravity of water, and therefore unsinkable, however perforated by shot, and capable of carrying armament and naval equipment to the extent of nearly one-half the weight of its own displacement in tons. Such vessels of light draught accompanying fleets of war as tenders to line-of-battle-ships, whence they might be manned and stored as occasion might require, would, I submit, form a useful auxiliary available for shore service, or for attacking land batteries, which deep draught ships of the line cannot approach, and would be sunk if they could.

I may observe that this idea was first broached by me two years since as being applicable to the construction of vessels for carrying treasure.—They might be wrecked ashore, but the treasure would be recoverable.

I am, Sir,
Your very obedient servant,
CHARLES ATHERTON.

Woolwich Dockyard, Jan. 10, 1859.

(*Times*, 7th Oct., 1859.)

NAVAL AND MILITARY INTELLIGENCE.

Since the *Trusty*, 14, steam floating battery, returned to her former moorings opposite Upnor Castle, Chatham, she has undergone an examination in order to ascertain the amount of injuries she had met with during the experiments that were made on her, with the view of testing her capabilities of resisting the effects of the shot fired from the Armstrong cannons at Shoeburyness. The result of the survey has demonstrated that this new kind of iron cased floating batteries presents comparatively no resistance whatever to the shots of the Armstrong guns. Although the *Trusty* is covered with massive wrought iron plates, of extraordinary thickness, yet every shot that struck them shivered the plates to pieces, and entered the vessel; some of the shots, it is evident from the examination, having passed through the iron plates and beams of the battery on one side, and through the timber and iron casing of the vessel on the other. The battery presents the appearance of having been most severely handled; and it is the unanimous opinion of the officers and others who have examined her, that vessels of this class will be found to be almost entirely useless when fired upon by guns of the Armstrong class.

It having been thus demonstrated that iron-cased ships must go to the bottom under the fire of modern ordnance, and recent events having also shown that ships of the ordinary build may be sunk by the fire even of an extemporized Chinese fort, the time has arrived when, as it appears to me, the principle of naval construction referred to in my letter published in the *Times* of the 12th January last may be appropriately revised. With a view to promoting this object, I now beg to suggest that if a fund to the extent of £250 only were publicly subscribed and placed at the disposal of the Council of the Society of Arts, Adelphi, London, to be awarded as premiums of £150 and £100 for the discovery and specification of the materials and process of manufacture most available for producing a combination of materials constituting a solidifying pulp possessing in the highest degree the properties of specific lightness, toughness, non-absorption of water, and cheapness, or a metallic cellular body having the same properties, I have no doubt that, at a moderate cost per ton of shipping, existing vessels may rendered unsinkable, and that a new modification of ships of war of all classes may be devised, such as may obviate the horrors which appear to be otherwise inevitable in maritime warfare under the fire of modern ordnance. Wholesale perdition being thus obviated, the power of nations will again be determined, as heretofore, by the virtues of personal prowess and endurance rather than by chicanery and mechanical device.

I am, &c., CHARLES ATHERTON.

Woolwich Dockyard, Oct. 11, 1859.

Proceedings of Institutions.

BRADFORD MECHANICS' INSTITUTION.—The opportunity of the meeting of the Social Science Association was taken by the managers of the Bradford Mechanics' Institution to hold their annual *soirée* for the distribution of prizes and certificates to the students at the last examination at the Society of Arts, on Wednesday evening, the 12th inst. The meeting was held in St. George's-hall, which was crowded.—Lord Brougham occupied the chair.—Mr. J. V. GODWIN, chairman of the Institute, read a report, giving a history of its origin and progress since its institution on the 14th of February, 1832. It had been constituted and administered by working men. The members had varied in number from 1,200 to 1,400.—Lord BROUGHAM said he had no conception, before his arrival in Bradford, of the flourishing state of that great Institution. It appeared to him to stand, he would not say singular, but amongst the very first in point of flourishing and success. In every one particular, since 1832, there had been a regular increase in the number of members, in the funds, in the library, and the most important of all, an increase in the number of the books lent out, and an improvement in the character of the books for which there was a demand of readers; but that which chiefly delighted him to find was the great proportion of working men who took part in the Institution. Taking the maximum number of members at 1,500, of these about 1,000, or two-thirds, were working men. This was a most gratifying circumstance, for Mechanics' Institutions had been derided as having been established for working men, but were more beneficial to others of a superior class of society than to that for which they were originally designed. Lord Brougham proceeded to urge the benefits which working men were deriving from such institutions; and reminded them that the attainment of knowledge would increase their political power; for experience told them on every soil that " they who think must govern those who toil." Their library now contained upwards of 7,000 volumes, and he was glad to learn that they were increasing year by year, and that those that were read were of a superior character, showing a more improved taste on the part of the readers. His lordship concluded by ordering the distribution of the prizes to the successful candidates, and said that afterwards prizes given by Mr. John Cassell (than whom no man had been a greater benefactor to the working classes) for essays written by working men would be awarded. Having, with Lord Shaftesbury, Mr. M. D. Hill, and Lord John Russell, had these essays placed before him, he could testify to the thought and talent they exhibited. The prizes and certificates were then distributed. The Earl of Shaftesbury said that he looked at Mechanics' Institutions as great systems of education, as great subsidiary means for carrying on the education acquired in early life, and as a great mode of civilising the masses of the population,—enabling them to retain what they had acquired and to add to their stores of knowledge. The only complaint he now heard of these Institutions was that they did not precisely answer the purpose for which they were originally intended, and that they did not educate and train the class for which they were founded. This might be true for other counties in England, but it was not so of Yorkshire; and of this he was quite sure, that even if the system had failed as to the particular class for which it was first intended, it had not failed altogether, for thousands, and many thousands, were enjoying its benefits. Let them rejoice that these associations had been instituted, and by degrees they would be extended so as to embrace the class for which they were originally intended. His lordship then mentioned the importance of better buildings being provided for these Institutions, which he considered ought to have a status and position in the eyes of the people, and possess a building which the working-man might call his own. He trusted that working-men would not be satisfied on all occasions merely with going to the reading room, and there passing an hour in conversation and the pursuits of literature, but that they would take home choice works to read to their wives and children, and thus enlighten, cheer, and he might say sanctify, the domestic hearth. Mechanics' Institutions were grand supplements of the early closing movement, which had already begun to pervade all the towns of the empire, as they would prevent that movement from being perverted into an opportunity to men to go to receptacles of vice and folly, by profitably occupying the working-man, and thus withdrawing him from temptation. He, therefore, rejoiced much to see the thriving condition of that association. There was no reason at all why labour should not be consistent with literature and knowledge, and knowledge and literature consistent with labour. That which kept the body in a healthy and vigorous state also kept the mind in a healthy and vigorous state. His lordship concluded by moving the following resolution:—" That this meeting desires to express its sympathy with the great work of popular education, and recognises the progress which has already been made as an earnest of still further success."—Mr. Commissioner Hill seconded the resolution.—The meeting was afterwards addressed by Sir J. Napier, Mr. E. Baines, M.P., and other gentlemen, and separated after passing a vote of thanks to the chairman.

Glasgow Athenæum.—The prizes and certificates awarded to the candidates from this Institution at the last Examinations of the Society of Arts, were presented to the successful competitors, at a meeting held on the 4th inst. The winter class season was opened on the same occasion Mr. Sheriff Bell occupied the chair. Mr. Sheriff Bell said—That having had the honour of being placed in the chair that evening, he might safely congratulate the Glasgow Athenæum, looking at the large and brilliant audience, on the favourable commencement of their winter campaign. He had long entertained the conviction that this Institution was one of great utility. It had afforded easy access to thousands of young men for lectures and books of the best description. It had also given to hundreds annually systematic education in well-conducted classes. In the reading rooms and library they had held pleasant intercourse together; and, in short, it was just such Institutions as this that marked the progress of a great and civilised country, and it was to such Institutions that its members, when removed far away across oceans, looked back with interest, with enthusiastic ardour. The long list of Presidents, Vice-Presidents, and Directors showed that the men of the best intellect and the best position in the West of Scotland—and even farther off—had taken a great interest in this Athenæum. After alluding with much feeling to the loss the Institution had sustained by the death of Professor Nichol, the chairman proceeded as follows:—" I must now proceed to say a few words upon a peculiar feature which has recently been introduced into the Athenæum, and which apparently is calculated much to add to its prosperity, and also to the prosperity of many similar and kindred Institutions. The Society of Arts of London is an old-established body—a most honourable body, both from its purposes and from the class of its membership. It has existed, I believe, for upwards of 100 years. In 1851 it gave the greatest aid to Prince Albert in his extensive and admirable scheme of the Exhibition of that year; and in 1856 a new idea occurred to its members—that of encouraging, by means of honorary rewards given to the best students, encouraging by public examinations, to be held all over the kingdom, a great and a numerous class of young men previously not provided with the same species of encouragement. You are all aware that the system of examination, of testing the capabilities and the mental strength of young men by examination, has long been an approved system in education. In our schools and our colleges the system has long been in use. In admissions to the learned professions —to divinity, law, and medicine—the candidates are tested by examinations in their respective bodies. Recently the Government of this country has seen fit to introduce examinations as passports to the army, passports to important situations in the civil service. You will at once see that these examinations are directed for the benefit of a particular class; they are directed for the benefit of young men who enjoy university education, or who aspire to the ranks of the army or to important civil offices. But there are hundreds of thousands of young men who have no such ambition, who, nevertheless, are most anxious to acquire a character for intelligence and sound information in the particular walks of life to which they are to devote themselves. Now, the idea which seems to have occurred to the Society of Arts is this—that they would institute a set of examinations which would be calculated to bring forward and encourage that class of young men." Mr. Sheriff Bell then explained, in some detail, the Society's system of Examinations, which he warmly commended. He drew special attention to " an admirably digested statement of the Society of Arts' scheme," by Mr. Alex. Richardson, Head Master of the Western Institution, and Lecturer on Logic at the Athenæum. The author says that in these examinations " the student knows and feels that he is competing, not with the narrow circle of his own class, whose acquirements have been measured by him, but with hundreds of eager, plodding, studious youths, in every considerable town of the empire, stimulated by the consciousness that their success in the generous contest is anxiously watched by their respective families, directors, and trustees." Again, he says—"It hardly requires to be added, that the proposed examinations being conducted by examiners utterly unconnected with any particular institution, and acting only by consent of the Society, must be presumed to be more impartial in their estimates than can be expected from any other arrangement." After describing in detail the success which the candidates from this Institution, as well as from another in the same city—the Glasgow Mechanics' Institution—had achieved, the chairman proceeded:—"I look upon these certificates, now that this Society is assuming the character which it is—now that unquestionably it appears to be becoming a national institution—as most valuable. And when we find that there are at least three hundred societies affiliated to the Society of Arts, scattered throughout the whole land, and numbering the most eminent Mechanics' Institutions, Athenæums, and other similar Institutions in the country—when we find such men as Lord Brougham, Sir John Bowring, and others, going to Manchester and Leeds, distributing these very certificates to the successful students—looking to all these things, I consider it becomes an object in a young man's ambition in commercial life, or in preparing to engage in the ordinary business of life, to be possessed of one of these certificates to show that he has studied those branches of knowledge. * * * * I was anxious to take this opportunity of explaining somewhat at length the objects of this scheme, which has recently, I may say, started into existence, but which appears to me likely to be of very great benefit to the cause of education in this country. I do not wish to speak in too exaggerated terms about the probable good it is to effect—that is in the hands of Providence—but as far as, humanly speaking, we can judge of it, and looking at the impartial and honourable manner in which it appears to be conducted—looking at the life and spirit which it is calculated to put into the local institutions, and even into the primary schools—for young men at school will begin to think of looking forward to this, and young men, on leaving school, will join the Institutions with the view of carrying the knowledge acquired at school into the competition and examination—looking at all these practical advantages, I cannot but think that the Society of Arts have conferred a benefit upon the country, perhaps likely to be a still more permanent benefit than even what they did for the great Exhibition of 1851. I certainly, in conclusion, will just say this, that I am not one of those who think that all this toil for human culture is likely to be unavailing. I take a more hopeful, and, I believe, a truer view of the subject. I think where human intellect is honestly exercised with the view of advancing the intellectual interests of our fellow-men, the probability is, in a free and enlightened country like this, that the whole population will be advanced some steps up the ladder of knowledge, and thereby that their civilisation and their happiness will be increased." The certificates and prizes were then distributed to the successful competitors. The Chairman then said that the Very Rev. Principal Barclay had agreed to be present, but had been prevented; and Bailie Gourlay would therefore move the resolution.—Bailie Gourlay then, in a few remarks, proposed, "That the Athenæum classes deserve the support of the commercial young men of Glasgow."—Mr. Jas. Hedderwick seconded the resolution. The ingenious and admirable scheme of the Society of Arts must, he should think, be eminently instrumental in imparting to such institutions as this a new, solid, and permanent attraction. The learned sheriff had shown that the certificate of the Society of Arts was something worth struggling for, even at some sacrifice. In the whole scheme of the Society of Arts he recognised the growth of a great social fact—namely, the opening up of the paths of honourable ambition to all. The fiat had gone forth, that in the fair fields of intellect there should be no degradation of caste. He saw in this movement a great union and co-operation for the advancement of the public good—fields where no differences distract, and where no interests clash. In this there was everything to encourage the educator and everything to delight the philanthropist. He would merely say, in conclusion, let the good work go on, let it be prosecuted with vigour, and the fruits would be at once abundant and glorious.—The resolution was then put to the meeting, and carried with acclamation. After a vote of thanks to the Chairman and the other gentlemen who had taken part in the proceedings of the evening, the meeting dissolved.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October 14th*, 1859.]

Dated 6th August, 1859.

1813. A. S. Stocker and G. J. Farmer, Birmingham—Certain imp. appertaining to articles to be affixed to boots and shoes, and to the feet of animals, and in machinery and means to be employed for producing the same.

Dated 9th August, 1859.

1842. F. L. Lawrence, 50, Berners-street, Oxford-street—Imp. in colouring and hardening elastic gums for dental purposes.

Dated 12th September, 1859.

2074. H. W. Ripley, Bradford—Imp in finishing dyed piece goods.

Dated 14th September, 1859.

2090. S. Hecht, 36, Gresham-street—A new mode of advertising.

Dated 17th September, 1859.

2122. T. Elliott, Manchester—Imp. in lubricators, especially applicable to steam engines.

Dated 20th September, 1859.

2137. A. Manbré, 10, Rathbone-place, Oxford-street—The manufacture of a colouring matter for colouring spirits, beers, vinegar, and other liquids and beverages.

Dated 21st September, 1859.

2148. H. A. Jowett, Sawley, Derbyshire—Imp. in breaks for railway and other carriages, with means of communication between guard or conductor and driver.
2149. J. Blair, Manchester—Certain imp. in the treatment of yarns during the operation of spinning, which treatment is also applicable in "roving," "slubbing," or "doubling" machines.
2152. R. Davison, London-street, London—Imp. in the construction of holders for containing liquid or air and other aeriform fluids, especially adapted for use in refrigerators.
2153. J. Harrison, Glossop, Derbyshire—An imp. in spinning mules, applicable also to the machines called twiners.

Dated 22nd September, 1859.

2156. R. B. Mowbray and T. Coatman, Manchester—Imp. in machinery or apparatus connected with and applicable to steam boilers and heating apparatus.
2158. E. Jones, Dudley, Worcestershire—An imp. or imps. in the manufacture of coke in open coke fires, or heaps.

Dated 23rd September, 1859.

2160. C. J. Parry, Manchester—Imp. in certain apparatus applicable to sewing machines.
2162. T. Bentley, Margate, Kent—Imp. in agricultural implements for gathering and destroying weeds and stubble.
2164. R. James, Manchester—Imp. in machinery or apparatus for covering crinoline, applicable also to braiding fancy patterns for other articles.

Dated 24th September, 1859.

2166. J. Gedge, 4, Wellington-street South, Strand—An improved stamp holder and cutter. (A com.)
2168. J. Coey, Liverpool—Imp. in or applicable to packages for containing butter, lard, and other articles.
2170. T. B. Daft, Tottenham, Middlesex—Imp. in coating metal conductors, suitable for electric telegraphs.
2172. J. Todd, Greenwich—Imp. applicable to screw propellers in the propulsion of vessels.

Dated 26th September, 1859.

2174. J. Fernihough, Dukinfield, Chester—Imp. in pistons, plungers, and buckets.

Dated 27th September, 1852.

2182. R. Coales, 53, Chancery-lane—An improved preparation or preparations for promoting the growth and otherwise improving the hair, and for the application of a certain material for like purposes.
2184. C. Cowper, 20, Southampton-buildings, Chancery-lane—Imp. in mixing or combining and deodorizing oil made from gas tar and other oils. (A com.)
2186. J. R. Piednue, Royal Mint Refinery, Royal Mint-street, Middlesex—An improved apparatus for transmitting motive power. (A com.)
2188. P. J. Lejeune-Chaumont, Faubourg Vivegnies, 138, Liége—Imp. in fire-arms and ordnance, and in projectiles and cartridges to be used therewith.

Dated 28th September, 1859.

2190. W. Collins, Salford, Lancashire—Imp. in stand pipes for hydrants.
2192. W. J. Dorning, Manchester—Certain imp. in traction engines

2194. E. S. Cathels and S. Splatt, Dover—Imp. in gas meters.
2200. P. Robertson, Sun-court, Cornhill—Imp. in the manufacture of manure.

Dated 29th September, 1859.

2202. C. Stevens, 1b, Welbeck-street, Cavendish-square—An improved steam dredging boat. (A com.)
2203. G. G. Page, Whitehall, and C. Lungley, Deptford, Kent—Imp. in gangways or step ladders, applicable to floating bodies and other useful purposes.
2205. W. Johnson, Horse Shoe-court, London—An imp. in purses.
2206. E. H. Bentall, Heybridge, near Maldon, Essex—Imp. in screw presses.
2207. C. Duplomb, Rue de Rivoli, No. 112, Paris—Imp. in presses for pressing or finishing textile fabrics.
2208. A. W. Williamson, University College, and L. Perkins, Francis-street, Gray's-inn-road—Imp. in steam boilers.
2209. W. Kempe, Holbeck Mills, Leeds—Imp. in machinery for raising the pile of woollen and other cloths.
2210. R. Oxland, Plymouth—Imp. in the treatment of saccharine matters.

Dated 30th September, 1859.

2211. J. Wadsworth, Manchester—Imp. in instruments or apparatus for measuring the quantity, for regulating the pressure, and for controlling the flow or passage of gas used for purposes of illumination, and in the construction of gas burners.
2212. T. Guibal, Hainaut Mines, Mons, Belgium—Modifying the installation and working of cables used in springing up mines.
2213. W. Hartley, Bury, Lancashire—Certain imp. in steam engines.
2215. T. Buckham, Gloucester—Imp. in the switches for railways.
2216. J. O. Smith, 18, Warwick-court, Gray's-inn—Imp. in the construction of children's carriages called "perambulators."
2217. B. Atkinson, Rainham, Essex—Imp. in railway brakes.
2218. W. H. Buckland, Maesteg Iron Works, Glamorganshire—Imp. in the preparation of peat.
2219. H. W. Hart, Fleet-street—Imp. in argand and other gas burners, partly applicable to oil and other lamps.
2220. W. Clark, 53, Chancery-lane—Imp. in railway signal apparatus. (A com.)
2221. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in the construction of apparatus for reworking the waste steam of steam-engines. (A com.)
2222. M. and A. Samuelson, Scott-street Foundry, Hull—Imp. in planing, slotting, and grooving machines.
2223. Hon. W. E. Cochrane, Osnaburgh-terrace, Regent's-park—Imp. in chairs and apparatus for receiving and securing the ends of the rails of railways.
2224. W. V. Edwards, Swindon, Wiltshire—Imp. in the construction of ways and apparatus to facilitate the conveyance of mails, goods, and passengers.

Dated 1st October, 1859.

2226. W. Parkin, Sheffield, and J. Bates, Hyde, Chester—Imp. in wedges for railway chairs.
2229. R. A. Brooman, 166, Fleet-street—Imp. in reverberatory puddling and other furnaces employed in the manufacture of iron. (A com.)
2231. J. Millar, Edinburgh—Imp. in reflectors for diffusing artificial light.
2232. L. Newton, Oldham, and J. Greaves, Staleybridge, Lancashire—Imp. in cop tubes or spools, and in machinery for manufacturing the same.
2233. G. Bridgett, Pilcher-gate, Nottingham—A new mode or method of manufacturing Shetland or other falls from the stocking frame.
2234. J. Wright, Teesdale Iron Works, South Stockton, Yorkshire—Imp. in apparatus for raising water and minerals from mines, which improvements are applicable to raising and hauling weights generally.

Dated 3rd October, 1859.

2235. E. Morewood, Enfield, Middlesex—Imp. in coating metals.
2237. L. H. I. Lemaire, Stamford-street, Blackfriars—Imp. in the manufacture of chenille.
2238. W. R. Earle and E. J. Barnes, Queen's-terrace, Queen's Head-lane, Islington—Imp. in photographic and other portraits.

Dated 4th October, 1859.

2239. G. F. Greiner, 57, Wells-street, St. Marylebone—Imp. in the construction of pianofortes.
2240. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—An improved coupling joint for pipes or tubes of soft metal, caoutchouc, gutta-percha, or other yielding matter. (A com.)
2241. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris—An improved "porte-jupe," or apparatus for suspending dress-skirts and other objects. (A com.)
2242. J. Loftus, Elton Fold, near Bury, Lancashire—Imp. in machinery for combining and carding cotton or silk and wool.
2243. R. and W. Hollis, High Coggs, Witney, Oxfordshire—Imp. in the construction of apparatus for winnowing and dressing grain.
2244. S. R. English, Birmingham—A machine or apparatus for taking copies of writing.
2245. R. Brearley, jun., Batley, Yorkshire—Imp. in means or apparatus for raising the nap or pile of cloths.
2246. W. Backett, Old Kent-road, Surrey—Improved cleansing powders.
2247. W. E. Newton, 66, Chancery-lane—Improved apparatus for generating steam. (A com.)
2248. J. M. Rose, R. Carte, and W. Pikesley, Charing-cross, Westminster—Imp. in drums.

Dated 5th October, 1859.

2251. J. Thompson, Witton, near Northwich, Cheshire, and J. Thompson, Castle, Northwich—The manufacture of salt by an improved and more economical mode.
2253. A. Whytock, 12, Little St. Andrew-street, Upper St. Martin's-lane—A mode or method of applying joined sheets of metal for roofing and other purposes.
2255. J. Shields, Perth, N.B.—Imp. in Jacquard looms or machinery for weaving.
2257. J. J. Eagleton, Birmingham—An imp. or imps. in annealing furnaces.
2259. G. Davies, 1, Serle street, Lincoln's-inn—Imp. in the method of, and apparatus for, vaporizing liquids and heating air. (A com.)
2261. J. Scott, Sunderland—Imp. in the manufacture of anchors.
2263. W. E. Newton, 66, Chancery-lane—Imp. in revolving fire-arms. (A com.)
2265. W. L. Earle, Alfred place, Bedford-square—Imp. in apparatus for promoting the combustion of smoke and gases arising from fuel.
2267. J. Macintosh, North Bank, Regent's-park—Imp. in the manufacture of flexible tubes.
2269. J. Macintosh, North Bank, Regent's-park—Imp. in coating metallic conductors for electric telegraphs.

WEEKLY LIST OF PATENTS SEALED.

[*From Gazette, October* 14*th*, 1859.]

October 13*th.*

936. T. Bird.
938. J. Beattie.
943. A. McDougall.
945. S. Barnwell & A. Rollason.
949. G. Ashcroft.
954. J. Glasgow and S. Hand.
958. J. Hamilton.
959. A. Courage.
971. J. Whittaker.
972. Joseph Seaman.
977. John Freer.
981. F. Edwards & W. Edwards.
985. P. Reynolds & J. Reynolds.
992. Q. Beck.
995. A. W. Williamson.
1008. E. Clark.
1014. C. Mansell.
1019. W. Dicks and W. Hopwell.
1024. R. A. Brooman.
1031. G. Ward.
1035. J. Holmes.
1036. A. W. Gadesden.
1037. E. Humphrys.
1062. Sir T. T. Grant, K.C.B.
1065. C. Randolph and J. Elder.
1079. E. A. Porteus and W. H. Burke.
1100. D. Moore.
1129. W. Clark.
1161. G. G. Bussey.
1183. M. Henry.
1197. W. Clark.
1222. L. D. Owen.
1251. W. C. Cambridge.
1500. G. T. Bousfield.
1654. T. Wright.
1668. J. Morgan.
1718. J. Hartley.
1765. J. Wood.
1774. W. Campbell and G. Worstenholm.
1808. R. T. Pattison.
1909. H. W. Harman.
1944. M. J. Stark.

Patents on which the Stamp Duty of £50 has been Paid.

[*From Gazette, October* 14*th*, 1859.]

October 11*th.*

2385. A. B. Seithen.
2394. W. Todd and J. Todd.

October 12*th.*

2405. T. Allen.
2434. A. V. Newton.
2460. A. Lorimier.
2544. C. De Jongh.
2545. P. Fairbairn & R. Newton.

[*From Gazette, October* 18*th*, 1859.]

October 13*th.*

2403. R. A. Brooman.

October 14*th.*

2467. G. Blair.

October 15*th.*

2419. E. Tombs.
2428. G. Wilson.
2432. G. Morton.
2494. L. A. Desachy.

Patents on which the Stamp Duty of £100 has been Paid.

[*From Gazette, October* 14*th*, 1859.]

October 11*th.*

356. J. Robinson.
371. W. McFarlane.

October 12*th.*

358. W. H. Smith.
557. R. Mallet.

[*From Gazette, October* 18*th*, 1859.]

October 13*th.*

399. J. Hopkinson.

October 14*th.*

409. E. Leigh.

October 15*th.*

422. G. R. Tovell and J. Mann.
432. E. Heywood.
761. S. Holt.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4,202.	Oct. 3rd.	Glazed and Covered Show Case...............	Williams and Bate...	Birmingham.
4,203.	„ 5th.	Improved Upper for Boots and Shoes	Thomas Ridge	5, Norway-place, Hackney-road, N.E.
4,204	„ 6th.	Improved Persian Coal Scoop.........	Loveridge and Shoolbred	Merridale Works, Wolverhampton.
4,205	„ 19th.	Dog-Cart Phaeton	Charles Sandford Windover...	Huntingdon.